

ROYAL ASTRONOMICAL SOCIETY.

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CAPT. W. H. SMYTH, R.N., Vice-President, in the Chair.

The Rev. A. D. Wackerbarth, Riverside, St. Peter's, Hammer-smith;

Samuel Charles Whitbread, Esq., Cardington, Bedfordshire;

The Rt. Hon. Sir Lancelot Shadwell, Vice-Chancellor of England;

W. M. Fisher, Esq., 39 Great George Street, Liverpool;

Rev. Alfred Weld, Director of the Observatory at Stonehurst College, Lancashire;

Charles B. Chalmers, Esq., Weston Super Mare, Somerset;

Rev. J. N. Peill, B.D., Queen's College, Cambridge;

George William Carrington, Esq., 2 Park Prospect, St. James's Park;

were balloted for and duly elected Fellows of the Society.

Wm. Cranch Bond, Esq., M.A., Director of the Observatory at Cambridge, Massachusetts, Fellow of the American Academy of Arts and Sciences, &c., was balloted for, and duly elected an Associate of the Society.

Transit of Mercury, Nov. 8 and 9, 1848, at Durham.

External Contact at Nov. 8, 23^h 5^m 32^s.14, Greenwich M.T. very uncertain

Internal Contact ——— 6 55.90, ——— ingress complete.

These observations were made by Mr. Thompson with the Fraunhofer equatoreal.

The same phenomena were observed by Professor Chevallier and another observer, the image of the sun being projected on a screen.

	Professor Chevallier.	2d Observer.	
	^h ^m ^s	^h ^m ^s	
External Contact	23 5 50.78	23 5 46.81	Greenwich M.T.
Internal Contact	7 21.53	7 16.57	

The following observations were made by Professor Chevallier with the Northumberland equatoreal of 5 inches' aperture and 7 feet focal length; they are corrected for the difference of refraction and parallax, and for the sun's motion in the interval between the observations of the planet and the sun: the images of the sun and planet were thrown on a screen:—

2d. When the planet is compared with the north limb of the sun.

1848.	Greenwich M.T.			N.P.D. Mercury — N.P.D. Sun.	Limb Planet Obsd.		Nov. 9	Greenwich M.T.			N.P.D. Mercury — N.P.D. Sun.	Limb Planet Obsd.
	h	m	s					h	m	s		
Nov. 9	1	36	39.3	— 1 59.2	Both			1	58	56.7	— 2 52.4	Both
		38	53.9	2 3.9	Do.			2	1	1.4	3 0.4	Do.
		40	39.7	2 7.7	Do.			(4)	0.9		3 4.7	Do.
		45	28.9	2 19.4	Do.			18	46.0		3 40.8	Do.
		47	13.5	2 25.5	S.			19	54.3		3 44.4	Do.
		49	13.2	2 22.3	Cent.			23	22.8		3 50.9	S.
		51	12.9	2 31.3	S.			25	32.4		3 59.8	Both
		54	35.4	2 42.9	Both			2	27	5.2	— 4 5.3	N.
	1	56	21.1	— 2 46.3	Do.							

“When the number of minutes is placed within brackets, there is an uncertainty of a minute.

“In the earlier part of the observations, the sun’s limb was ill-defined in the equatoreal; but it was well seen afterwards. The sun’s image received on a screen was very clear throughout the observations.”

Mr. Thompson made some observations in right ascension with the Fraunhofer equatoreal at the beginning of the transit, but the sun’s limb was so badly defined and the wind so troublesome at that time, that he does not place any reliance on them.

IRIS.

LIVERPOOL.			Equatoreal.			(Mr. Hartnup.)		
Greenwich M.T.			R.A.			Log $\frac{p}{P}$		
1848.	h	m	s	h	m	s	Log $\frac{q}{P}$	Star.
Dec. 21	13	24	11.7	10	26	55.39	— 8.474	86 38 9.7 — 9.889 a
	14	0	22.7			55.62	8.400	16.3 9.887 a
	14	31	53.6			55.84	8.313	22.7 9.885 a
1849.								
Jan. 3	14	18	31.8	10	27	8.33	8.188	87 30 30.3 9.890 b
	14	53	12.5			8.11	— 8.129	33.4 — 9.889 b
a.....B.A.C. 3684			b.....B.A.C. 3600					

The places of the stars are taken from the catalogue. Log $\frac{p}{P}$ and log $\frac{q}{P}$ have the signification given to them by Professor Challis, in vol. viii. p. 206, of the *Monthly Notices*.

HAMBURG.			Equatoreal.			(M. C. Rümker.)			
Hamburg M.T.			R.A.			Decl.			
1848.	h	m	s	°	'	"	°	'	"
Dec. 10	15	21	14.7	155	42	48.5	+ 4	26	51.8
14	13	21	56.3	156	10	45.7	4	1	32.4
19	13	13	47.0		36	22.2	3	32	34.0
20	13	0	2.0		40	13.8		27	23.7
21	12	43	1.6		43	37.4		22	13.8
24	12	39	59.8		51	27.5	3	7	17.6
26	12	12	34.6		54	21.0	2	58	37.1
28	12	10	20.9	156	55	21.5	+ 2	50	18.7

Meridian Circle.

	Hamburg M.T.	R.A.	Decl.
1848.	^h ^m ^s	[°] ['] ["]	[°] ['] ["]
Dec. 28	16 6 50.3	156 55 19.1	+2 49 39.7
29	15 52 54.5	54 56.3	45 48.4
1849.			
Jan. 1	40 53.8	51 40.9	35 26.2
2	36 49.2	49 31.8	32 18.6
3	32 43.6	47 4.2	29 26.6
4	15 28 35.8	156 44 3.0	+2 26 43.5

Elements. By Mr. Norman Pogson.

Epoch 1849, Jan. 0.0, Greenwich M.T.

Mean Anomaly	68 44 5.05	} Mean Equinox, 1849, Jan. 0.0
π	41 21 2.43	
Ω	259 47 14.88	
i	5 28 13.74	
ϕ	13 19 42.20	
e	0.2305366	
Log a	0.3772307	
a	2.3835872	
Log q	0.2634187	
q	1.8340821	
Log μ	2.9841605	
μ	964".1851	
Sid. Period	1344.139 days.	

From observations made in 1848, at Cambridge on Feb. 17th, and at South Villa on Aug. 7th and Dec. 13th.

The above elements, when compared with the middle observation, give the following equations :—

Observed—Computed.

In Longitude..... = +0.83

In Latitude = +0.14

FLORA.

HAMBURG.

Equatoreal.

(M. C. Rümker.)

	Hamburg M.T.	R.A.	Decl.
1848.	^h ^m ^s	[°] ['] ["]	[°] ['] ["]
Dec. 24	17 14 36.1	207 11 12.7	—5 37 14.2
28	17 0 19.0	208 28 56.0	5 58 51.5
29	17 45 7.5	208 48 48.8	6 4 21.7
1849.			
Jan. 2	17 35 10.2	210 3 40.7	6 23 35.9
3	16 55 51.0	210 21 17.4	—6 28 1.5

NEPTUNE.

LIVERPOOL.

Equatoreal.

(Mr. Hartnup.)

1848.	Greenwich M.T.			R.A.			Obs ^d —Cal ^d			N.P.D.			Obs ^d —Cal ^d		
	h	m	s	h	m	s	h	m	s	°	'	"	h	m	s
Nov. 30	6	46	21.6	22	9	1.35	—1	53		102	7	14.7	+	8	3
Dec. 5	7	22	31.9		9	16.33		1.42			5	50.3		8	3
6	7	38	9.9		9	19.33		1.46			5	31.2		8	3
11	8	23	17.7		9	38.02		1.12			3	44.2		6	6
15	5	4	7.0		9	53.92		1.46			2	13.1		7	6
19	5	14	38.5		10	13.99		1.21		102	0	26.9		7	1
21	4	45	32.7		10	23.86		1.13		101	59	32.6		8	7
22	5	41	4.3		10	28.01		1.22			59	4.0		10	5
28	5	28	47.7		11	1.19		1.18			55	53.4		7	0
1849.															
Jan. 2	5	59	31.6	22	11	31.60	—1	32		101	53	3.9	+	9	4

“The observations have been corrected for refraction and parallax, and compared with Mr. Adams’s Ephemeris.

“The stars of comparison for Nov. 30 and Dec. 5 are the mean of 7722 and 7821 B.A.C.; for Dec. 6, 7722 B.A.C.; and for the remainder, 7821 B.A.C. The places have been taken from the catalogue cited.”

HEBE.

HAMBURG.

Equatoreal.

(M. C. Rümker.)

1848.	Hamburg M.T.			R.A.			Decl.			No. Comps.
	h	m	s	h	m	s	°	'	"	
Nov. 19	11	2	45.6	97	36	43.1	+2	30	19.0	13
21	16	25	25.5		19	58.8		28	5.9	12
22	10	21	27.6		14	28.0		26	33.9	14
23	10	18	51.0	97	5	51.5		25	31.6	4
24	16	31	19.6	96	54	21.8		24	56.8	7
29	9	27	46.3	96	5	58.2		25	28.7.1	1
Dec. 2	10	59	28.9	95	29	13.9		28	53.5	18
3	9	58	8.0	95	17	4.5		30	27.6	16
5	9	52	59.6	94	50	52.2		34	28.9	5
11	9	45	57.7	93	25	5.5		2	52	35.6
14	9	0	26.8	92	39	43.0		3	5	14.2
17	10	17	18.8	91	51	59.9		+3	20	32.8

Meridian Circle.

1848.	h m s			° ' "			° ' "			
Dec. 14	12	34	25.3	92	37	24.5	+3	5	51.7	
17		20	30.5	91	50	32.0		21	5.3	
19		10	33.0		19	2.8		32	18.2	
20		5	33.9	91	3	11.1		38	20.1	
21	12	0	35.1	90	47	25.6		3	44	33.6
24	11	45	39.4	90	0	20.0		4	4	43.9
26		35	44.2	89	29	24.5		19	13.0	
28		25	51.4	88	59	4.8		34	34.4	
29		20	56.0		44	10.0		4	42	30.4
1849.										
Jan. 1		6	15.5	88	0	51.6		5	7	28.6
2	11	1	23.9	87	46	53.8		16	7.9	
3	10	56	33.7		33	17.1		24	54.9	
4	10	51	44.5	87	19	56.1	+5	33	52.3	

METIS.

Letter from Mr. Graham.

“The enclosed ephemeris of *Metis* is founded on the following set of elements:—

Epoch 1848, May 0^o 0['] 0["], Greenwich Mean Time.

M		144 24 39 ^o 9	
$\pi - \Omega$		2 28 54 ^o 0	} Mean Eq ^y . May 0 ^o 0 ['] 0 ["]
Ω		68 28 44 ^o 0	
i		5 35 34 ^o 5	
ϕ		7 2 53 ^o 85	
Log a		0.3776688	
μ		962 ["] 7275	

“These agree very fairly with the following places, which were obtained by the aid of my second set of elements. The places are referred to mean equinox May 0^o, and have been corrected for the perturbations of the *Earth*, *Mars*, *Jupiter*, and *Saturn*, from the epoch.

G.M.T.	Geo. Long.	Geo. Lat.	Obs.
1848. May 6 ^h 5	222 39 31 ^o 12	3 44 20 ^o 22	31
26 ^h 5	218 15 43 ^o 00	2 58 40 ^o 72	38
June 15 ^h 4	215 58 29 ^o 13	2 9 30 ^o 14	13
July 5 ^h 4	216 17 57 ^o 54	1 25 10 ^o 71	14
26 ^h 1	219 4 58 ^o 78	0 47 16 ^o 92	3

“For the last three observations we are indebted to the Cambridge Observatory.

“The corrections of those calculated by these places are,—

	Long.	Lat.
May 6 ^h 5	0 ^o 00	0 ^o 00
26 ^h 5	—0 ^o 15	—0 ^o 06
June 15 ^h 4	+3 ^o 36	—6 ^o 54
July 5 ^h 4	+1 ^o 51	—1 ^o 88
26 ^h 1	—0 ^o 04	0 ^o 00

“In calculating the ephemeris I made use of these constants,—

A	160 52 35 ^o 4	+1 ^o 003 $d\Omega$
B	73 21 15 ^o 7	+1 ^o 011
C	60 7 10 ^o 2	+0 ^o 889
Log a	9.9982074	—0 ^o 08 $d\Omega$
b	9.9558466	+0 ^o 92
c	9.6418949	—3 ^o 55

“ $d\Omega$ is to be reckoned from 1849, Jan. 1^o.

$$x = ra \sin (A + v)$$

$$y = rb \sin (B + v)$$

$$z = rc \sin (C + v)$$

"It was my original design to correct the ephemeris for the perturbations; but the orbit is still so uncertain that I judge it better to publish the results as they are than to go over ground which might have to be retraced.

Ephemeris.

Greenwich Mean Midnight.

1849. Feb.	1	R.A.			N.P.D.			Log Δ
		^h	^m	^s	^o	[']	["]	
	1	19	28	26.65	114	13	26.7	0.54469
	2		30	18.34		10	33.3	.54395
	3		32	9.85		7	36.0	.54320
	4		34	1.17		4	34.6	.54242
	5		35	52.28	114	1	29.4	.54163
	6		37	43.21	113	58	20.3	.54082
	7		39	33.92		55	7.3	.54000
	8		41	24.43		51	50.5	.53916
	9		43	14.73		48	29.9	.53830
	10		45	4.82		45	5.7	.53742
	11		46	54.69		41	37.9	.53653
	12		48	44.34		38	6.4	.53562
	13		50	33.76		34	31.4	.53469
	14		52	22.95		30	52.9	.53375
	15		54	11.89		27	11.0	.53279
	16		56	0.60		23	25.7	.53181
	17		57	49.06		19	37.1	.53081
	18	19	59	37.26		15	45.3	.52980
	19	20	1	25.21		11	50.3	.52876
	20		3	12.89		7	52.1	.52771
	21		5	0.29	113	3	50.9	.52665
	22		6	47.42	112	59	46.7	.52556
	23		8	34.27		55	39.6	.52446
	24		10	20.82		51	29.6	.52335
	25		12	7.08		47	16.7	.52221
	26		13	53.04		43	1.2	.52106
	27		15	38.70		38	43.0	.51989
	28		17	24.04		34	22.2	.51870
March	1		19	9.07		29	58.8	.51750
	2		20	53.79		25	33.0	.51628
	3		22	38.19		21	4.8	.51504
	4		24	22.26		16	34.2	.51378
	5		26	6.01		12	1.3	.51251
	6		27	49.43		7	26.2	.51122
	7		29	32.52	112	2	49.0	.50991
	8		31	15.28	111	58	9.7	.50859
	9		32	57.70		53	25.8	.50725
	10		34	39.77		48	45.3	.50590
	11		36	21.51		44	0.1	.50452
	12		38	2.90		39	13.2	.50313
	13		39	43.94		34	24.6	.50172
	14		41	24.62		29	34.2	.50029
	15		43	4.94		24	42.3	.49884

1849.		R.A.			N.P.D.			Log Δ
		h	m	s	°	'	"	
March	16	29	44	44.89	111	19	48.9	9.49738
	17		46	24.47		14	54.1	.49590
	18		48	33.67		9	58.0	.49440
	19		49	42.49		5	0.6	.49289
	20		51	20.92	111	0	2.1	.49135
	21		52	58.96	110	55	2.6	.48980
	22		54	36.58		50	2.0	.48823
	23		56	13.81		45	0.6	.48665
	24		57	50.62		39	58.3	.48504
	25	20	59	27.01		34	55.4	.48342
	26	21	1	2.98		29	51.7	.48178
	27		2	38.52		24	47.5	.48012
	28		4	13.62		19	42.9	.47844
	29		5	48.29		14	37.8	.47675
	30		7	22.52		9	32.5	.47504
	31		8	56.30	110	4	26.9	.47331
April	1	10	29	6.3	109	59	21.3	.47156
	2		12	2.50		54	15.5	.4698a
	3		13	34.92		49	9.9	.46802
	4		15	6.87		44	4.4	.46623
	5		16	38.37		38	59.0	.46441
	6		18	9.40		33	53.9	.46258
	7		19	39.95		28	49.1	.46073
	8		21	10.04		23	44.8	.45886
	9		22	39.62		18	41.1	.45698
	10		24	8.74		13	38.0	.45508
	11		25	37.36		8	35.6	.45316
	12		27	5.48	109	3	34.1	.45122
	13		28	33.10	108	58	33.6	.44927
	14		30	0.21		53	34.0	.44730
	15		31	26.80		48	35.7	.44531
	16		32	52.85		43	38.6	.44330
	17		34	18.37		38	42.9	.44128
	18		35	43.35		33	48.7	.43923
	19		37	7.77		28	56.1	.43716
	20		38	31.64		24	5.2	.43509
	21		39	54.94		19	16.1	.43299
	22		41	17.66		14	28.9	.43088
	23		42	39.80		9	43.7	.42875
	24		44	1.35		5	0.6	.42660
	25		45	22.30	108	0	19.7	.42443
	26		46	42.65	107	55	41.3	.42225
	27		48	2.38		51	5.2	.42004
	28		49	21.48		46	31.7	.41783
	29		50	39.96		42	0.8	.41559
	30		51	57.81		37	32.7	.41334
May	1		53	15.03		33	7.4	.41107
	2		54	31.59		28	45.0	.40879
	3	21	55	47.51	107	24	25.9	.40649

Corrected for aberration, but not for perturbations.

PETERSEN'S SECOND COMET.

LIVERPOOL.*				Equatoreal.				(Mr. Hartnup.)				
Greenwich M.T.				R.A.			N.P.D.			Corr ⁿ R.A.	Ephem ^s N.P.D.	Star Comp ⁿ .
1848.	h	m	s	h	m	s	°	'	"	s	"	
Dec. 17	5	56	28.9	21	59	59.62	82	7	47.8	-0.94	+ 8.1	a
	6	8	57.6	22	0	1.14		8	24.4	1.20	3.4	a
	6	17	25.4			2.30		8	54.4	1.27	5.4	a
	6	38	10.0			5.28		9	58.6	1.26	0.9	a
	6	47	33.1			6.85	10	32.1	1.05	3.3		a
	7	13	56.3			10.46	11	59.1	1.23	3.0		a, b
	7	30	31.9			12.80	12	52.3	1.20	1.4		a, b
	7	46	56.3			15.16	13	49.9	1.27	4.5		a, b
19	5	51	59.0	22	6	47.62	84	44	26.1	1.21	3.5	7723 B.A.C.
	5	59	22.9			48.45		44	46.5	1.42	0.0	—
20	7	30	34.1	22	10	22.34	86	6	34.0	0.98	3.0	7827
	7	43	33.1			24.44		7	15.6	0.69	3.4	—
21	5	49	23.5	22	13	26.73	87	17	7.2	1.03	10.4	7814
	6	2	49.8			28.78		17	52.4	0.23	13.6	7827
	6	18	7.2			30.69		18	37.3	1.01	10.5	7814
	6	29	10.0			32.30		19	14.5	0.91	13.2	7827
	6	48	27.1			34.58		20	13.1	1.27	11.3	7814
22	6	27	51.9	22	16	48.18	88	33	50.1	0.88	17.3	7772
	6	45	1.6			50.18		34	37.5	1.24	11.7	7772, 7838
	7	10	58.6			53.87		35	54.3	1.03	8.6	—
23	7	11	35.4	22	20	7.64	89	49	28.0	0.99	20.2	7865
	7	23	11.8			9.18		50	4.9	1.00	21.8	—
28	6	26	14.5	22	35	36.37	95	34	58.1	0.67	22.6	7884
1849.	6	54	19.7			39.85		36	11.1	-0.73	+ 18.0	7986
Jan. 15	6	0	39.8	23	24	46.14	112	6	44.5	...	...	8155
	6	20	15.3			47.79		7	27.1	...	...	—
	6	36	59.4			49.50		8	3.9	...	...	8161
	6	51	53.0			51.18		8	25.6	...	...	—
	6	0	39.8			46.14		6	44.5	...	...	8155
	6	20	15.3			47.79		7	27.1	...	...	—
	6	36	59.4			49.52		8	3.9	...	...	8161
	6	51	53.0			51.18		8	25.6	...	...	—
	7	4	56.7			52.75		8	41.9	...	...	—
	7	22	3.0			54.54		9	9.5	...	...	8155

"The corrections are to be applied algebraically to the ephemeris to represent the observations.

"All the observations, except those of Jan. 15, are made with illuminated wires on a dark field; the powers used were 180 for the first series and 134 for the rest.

"The declinations on Dec. 21, 22, and Jan. 15, are deduced from the readings of the declination circle; on the other days the differences of declination were measured by the micrometer.

"On Jan. 15 the illuminated wires were found to be too bright, and I employed a reticule with thick wires, five for transits and two crossing the field, and cutting each other at an angle for declination. The star of comparison and the comet were

* These observations are given in fuller detail than is usual, to enable astronomers to judge of the probable accuracy of the determinations of the Liverpool observatory, which is now completely furnished and in full activity.

made to pass at the angle thus formed. The assumed mean places of a and b for Jan. 1, 1849, are

a	R.A. =	^h 21 ^m 55 ^s 7 ^o ·02	N.P.D. =	^o 82 ['] 12 ["] 55 [·] 26
b		22 8 25 [·] 87		82 12 17 [·] 24

as found by one comparison by the equatoreal with 7788, 7833 B.A.C. The other stars are taken from the B.A.C. catalogue.

"In the last six observations of Jan. 11, the comet was so low that the Greenwich Refraction Tables do not apply. I, therefore, computed the refraction from Argelander's supplemental table in the *Tabulæ Regiomontanæ*.

"Easterly winds and fog rendered the definition of the comet somewhat vague in general; but on two or three favourable occasions the nucleus appeared stellar; and even through fog and haze the light was sufficiently condensed about the centre to admit of accurate bisection."

HAMBURG.

Equatoreal.

(M. C. Rümker.)

	Hamburg M.T.	R.A.	Decl.
1848.	^h ^m ^s	^o ['] ["]	^o ['] ["]
Nov. 7	16 34 44 [·] 4	288 35 33 [·] 0	+ 55 25 16 [·] 1
8	16 36 43 [·] 4	289 45 55 [·] 9	54 38 3 [·] 5
14	6 20 3 [·] 4	296 13 6 [·] 3	49 47 1 [·] 2
15	5 57 6 [·] 5	297 20 53 [·] 3	48 50 9 [·] 3
19	5 45 30 [·] 9	301 52 55 [·] 7	44 43 40 [·] 2
20	5 45 16 [·] 3	303 0 28 [·] 3	43 37 44 [·] 8
21	5 52 58 [·] 7	304 7 44 [·] 4	42 30 5 [·] 3
22	7 54 12 [·] 9	305 19 38 [·] 8	41 15 15 [·] 1
23	7 5 13 [·] 8	306 23 21 [·] 0	40 6 59 [·] 6
25	7 29 33 [·] 3	308 35 17 [·] 5	37 39 43 [·] 8
29	6 42 25 [·] 0	313 43 26 [·] 5	32 26 11 [·] 4
Dec. 1	7 5 52 [·] 7	314 53 51 [·] 4	29 53 28 [·] 3
2	6 37 20 [·] 6	315 54 3 [·] 8	28 33 48 [·] 4
3	8 10 53 [·] 6	316 58 33 [·] 5	27 6 8 [·] 9
5	6 57 5 [·] 3	318 54 50 [·] 3	24 24 16 [·] 1
	6 56 35 [·] 2	55 15 [·] 9	24 24 [·] 2
9	6 3 20 [·] 4	322 44 52 [·] 5	18 52 13 [·] 1
10	6 7 52 [·] 8	323 41 38 [·] 9	17 27 58 [·] 3
11	5 30 10 [·] 0	324 35 39 [·] 5	16 6 41 [·] 4
12	6 27 20 [·] 2	325 32 48 [·] 5	14 35 11 [·] 4
13	5 57 21 [·] 8	326 26 35 [·] 1	13 19 1 [·] 4
17	6 23 3 [·] 2	329 59 19 [·] 6	7 53 4 [·] 9
19	9 23 14 [·] 7	331 47 55 [·] 6	5 6 29 [·] 2
20	5 49 37 [·] 7	332 30 54 [·] 4	+ 4 0 51 [·] 9
24	5 52 15 [·] 4	335 45 50 [·] 0	- 0 55 33 [·] 4
28	6 41 3 [·] 1	338 53 24 [·] 4	5 33 49 [·] 5
29	5 53 32 [·] 8	339 36 58 [·] 6	6 37 38 [·] 7
30	6 21 38 [·] 4	340 22 20 [·] 4	7 42 55 [·] 3
1849.			
Jan. 1	7 3 28 [·] 2	341 51 0 [·] 4	9 49 47 [·] 4
2	5 45 8 [·] 0	342 32 28 [·] 7	10 46 53 [·] 9
3	5 44 3 [·] 5	343 14 10 [·] 5	11 45 55 [·] 4
4	6 3 43 [·] 0	343 57 1 [·] 1	- 12 44 40 [·] 7

Note.—On Dec. 5, at 6^h 57^m 5^s·3, Hamburg M.T., the nucleus of the comet covered a fixed star, observed by Bessel, zone 323. The star was seen distinctly *through* the comet.

HAMBURG.

(M. C. Rümker.)

1848.	Hamburg M.T.	R.A.	No. Obs.	Decl.	No. Obs.
	h m s	° ' "		° ' "	
Dec. 1	7 33 35.3		2	+ 29 52 10.0	1
	7 41 26.1	20 59 41.80			
5	6 57 35	21 15 39.35		24 24 42.5	
10	6 58 11.8	34 54.45	7	17 24 57.7	7
11	6 13 17.2	21 38 29.73	6	+ 16 4 31.8	6
24	6 53 12.0	22 23 11.97	4	— 0 58 33.1	4
28	7 26 35.3	35 38.75	6	5 35 43.8	6
29	6 57 49.0	22 38 35.67	8	— 6 40 28.7	8

Not corrected for parallax or refraction.

Corrections of Lindenau's Elements of the Orbit of Venus, deduced from the Greenwich Planetary Observations, 1750–1830. By Mr. Hugh Breen, of the Royal Observatory, Greenwich.

In the Greenwich observations from 1750 to 1830 are contained upwards of one thousand observations of *Venus*, and it seems plain that corrections of the elements of her orbit deduced from so extensive a series of observations must be valuable. Impressed with this conviction, the late Mr. Hugh Breen commenced this work, which has been brought to completion by the author with the assistance of his brother, Mr. James Breen, of the Cambridge observatory.

Lindenau's corrected elements of the epoch 1750 were deduced from Bradley's Greenwich observations, 1750–1756. When the places used by him are compared with those given in the Greenwich Planetary Reductions sensible differences are frequently found. In 23 cases out of 78, the difference of R.A. exceeds 5"; and in finding the N.P.D. Lindenau appears to have overlooked the index error of the iron quadrant from 1750–1753, which in some instances amounted to 14".

If the solar tables be supposed to be correct, and the perturbations of *Venus* to be rightly tabulated, any error in the computed place can only arise from errors in the elements of the orbit employed in constructing the tables. In the Greenwich Reductions, the error of geocentric longitude for each mean group of observations is expressed in terms of the errors of heliocentric longitude and radius vector.

By an investigation which the author gives, and which besides is well known, these latter errors may be expressed in terms of the errors of the elements. Since the inclination of the orbit is small, the reduction to the ecliptic may be supposed to be exactly known, and the error of longitude will be nearly independent of the errors of the node and inclination. Hence each mean group of observations furnishes an equation of condition between the errors of the

mean distance, the eccentricity, the epoch of mean longitude, and the longitude of the aphelion. The formation of the equations is given in a series of tables, and in such detail that any portion of the work may be readily verified. The 254 equations thus formed are then divided into groups of convenient extent, and each group is separately solved in the following manner. Each equation of condition is multiplied by the number of observations on which it depends, and the resulting equations are combined by addition, after changing the signs so that the co-efficients of each of the unknown quantities in succession are made positive.

The errors of the tabular elements obtained for different periods are given in the following table:—

No. of Eq ^{ns} .	Extent of Group.	δa	δe	δs	$\delta \Pi$
1-33	1750 Oct. 13, to 1755 July 28	+0.0000179	+0.0000145	-2.81	-55.2
34-68	1756 Mar. 5, 1761 Nov. 11	0.0000111	0.0000179	3.46	87.2
69-104	1762 July 5, 1769 Aug. 10	0.0000039	0.0000134	5.28	141.1
34-57	1756 1759	0.0000167	0.0000233	6.87	14.9
58-80	1759 Sept. 19, 1763 Aug. 29	0.0000071	+0.0000130	1.71	98.9
122-140	1788 May 29, 1799 Dec. 26	0.0000037	-0.0000087	-0.76	-403.7
147-158	1811 Aug. 24, 1818 June 1	0.0000118	0.0000012	+3.52	+81.7
159-200	1819 Feb. 15, 1822 Dec. 1	0.0000111	0.0000099	+1.00	-238.2
201-227	1823 Mar. 23, 1826 Aug. 30	0.0000046	0.0000219	-1.67	269.2
228-254	1828 Feb. 15, 1830 Nov. 16	+0.0000111	-0.0000145	-2.34	-351.8

The first group consists of the observations from which Lindenau derived his corrections of Lalande's Elements at the epoch 1750.

The errors of heliocentric ecliptic solar distance are next treated in a similar manner to those of the longitude.

As the inclination of the orbit is small, the errors of longitude, which are themselves in general small, will produce only an inappreciable effect on the errors of ecliptic polar distance, which may, therefore, be taken to depend solely on the errors of the node and inclination. The equations of condition are consequently very simple, and each group has been solved by the method of least squares. The following table gives the resulting errors of the elements:—

No. of Eq ^{ns} .	Extent of Group.	δN .	δI .
1-33	1750 Oct. 13, to 1755 July 28	+ 90.6	-8.27
34-57	1756 March 5, 1759 Aug. 3	108.5	4.05
58-80	1759 Sept. 19, 1763 Aug. 29	115.5	7.08
81-104	1764 Jan. 31, 1769 Aug. 10	94.5	5.07
122-140	1788 May 29, 1799 Dec. 26	30.5	3.76
147-158	1811 Aug. 24, 1818 June 1	25.6	4.54
159-200	1819 Feb. 15, 1822 Dec. 1	43.8	3.18
201-227	1823 March 23, 1826 Aug. 30	34.3	4.57
228-254	1828 Feb. 15, 1830 Nov. 16	+ 7.4	-2.21

The large errors of the node and inclination at the epoch 1750-1755, probably arise from the neglect of the index error of Graham's quadrant, from 1750-1753, before mentioned.

On that Part of the Equation of Time which Depends on the Obliquity of the Ecliptic. By John Riddle, Esq.

"Let ω = obliquity; l = sun's longitude; a = sun's right ascension; δ = sun's declination.

Then $l - a = x$ = that part of the equation of time here spoken of.

Now, $\cos \omega = \tan a \cdot \cot l$,

$$\text{or} \quad \frac{\cos \omega}{1} = \frac{\tan a}{\tan l}$$

$$\frac{1 + \cos \omega}{1 - \cos \omega} = \frac{\tan l + \tan a}{\tan l - \tan a};$$

$$\text{or} \quad \cot^2 \frac{\omega}{2} = \frac{\sin(l+a)}{\sin(l-a)} = \frac{\sin(l+a)}{\sin x}$$

$$\therefore \sin x = \sin(l+a) \cdot \tan^2 \frac{\omega}{2}.$$



"From this it is evident that $\sin x$ and $x = 0$ when $\sin(l+a) = 0$, that is, when $l+a = 0; 180^\circ; 360^\circ$; or 540° ; and these values of $l+a$ occur at the equinoxes and solstices.

"The greatest values of $\sin x$ and of x correspond to the greatest value of $\sin(l+a)$, viz. when

$$l+a = 90^\circ, 270^\circ, 450^\circ \text{ or } 630^\circ,$$

$$\text{and} \quad \sin(l+a) = 1, -1, 1 \text{ or } -1;$$

which will give x alternately positive and negative; if X be the maximum value of x ,

$$\sin X = \pm \tan^2 \frac{\omega}{2} \dots\dots\dots 1$$

$$\text{" Again, when } l+a = 90^\circ$$

$$2l - (l-a) = 90^\circ$$

$$\text{or} \quad 2l - X = 90^\circ$$

$$\text{and} \quad l = \frac{1}{2}(90^\circ + X) \dots\dots\dots 2$$

$$\text{and} \quad a = (90^\circ - l) \dots\dots\dots 3$$

"Also, when $x = X$,

$$\cos l = \cos a \cdot \cos \delta$$

$$= \sin l \cdot \cos \delta \quad (\cos a = \sin l, \text{ equat. 3})$$

$$\therefore \cot l = \cos \delta \dots\dots\dots 4$$

"The equations (1), (2), (3), (4), furnish an easy means of finding

successively the quantities x , l , a , and δ , when x is at its maximum value. Collecting them we have

$$\sin X = \tan^2 \frac{\omega}{2}$$

$$l = \frac{1}{2} (90 + X)$$

$$a = 90 - l$$

$$\cot l = \cos \delta$$

Let

$$\omega = 23^{\circ} 27' 36''$$

$$\frac{\omega}{2} = 11^{\circ} 43' 48''$$

$$\tan \frac{\omega}{2} = 9.3173030$$

$$\sin X = \underline{8.6346060}$$

$$X = 2^{\circ} 28' 15.5''$$

$$l = 46^{\circ} 14' 7.75''$$

$$a = 43^{\circ} 45' 52.25''$$

l and a are found, almost by inspection, from x , and for δ ,

$$\delta = \cos^{-1} (\cot l) = \cos^{-1} [\cot 46^{\circ} 14' 7''.75] = 16^{\circ} 42' 32''.$$

“That some of the relations expressed are new, I have some reason to believe; they are certainly concise, and exhibit the dependence of the various quantities on each other, better than those which are usually given in the treatises on astronomy.”

M. Rümker has sent a complete series of the meridian observations of the moon, made at the Observatory, Hamburg, between Jan. 3, 1845, and Feb. 16, 1848. The transits of the moon and moon-culminating stars have been generally observed over 13 wires, and the declinations of the stars and of the bright limb read off by 4 verniers. This and similar contributions are of great use, as affording accurate values of the errors of the lunar tables in reducing corresponding observations; and they are carefully preserved for that purpose.

The Rev. Temple Chevallier exhibited a volume, containing diagrams and observations of the Solar Spots, and expressed his intention of completing the same and presenting it to the Society.

Mr. Graham, of the Markree observatory, sends the following errata in Shortrede's logarithms:—

Antilog. of .58643, for 8662, read 8602

Sin. $60^{\circ} 18' 25''$ 8756, 8656